Determination of the level of university digitalization by the method of the higher education institutional ranking of the Kyrgyz Republic

Koshoeva Bibigul Beishenbekovna
Ph.D., Associate Professor, I.Razzakov Kyrgyz State Technical University, Kyrgyzstan, 720044, Bishkek, 66 Aitmatov Ave., e-mail: koshoeva@kstu.kg

Chynybaev Mirlan Koichubekovich
Ph.D., Associate Professor, I.Razzakov Kyrgyz State Technical University, Kyrgyzstan, 720044, Bishkek, 66 Aitmatov Ave., e-mail: chynybaev@kstu.kg

Bakalova Aigiuzel Taalaibekovna
Senior Lecturer, I.Razzakov Kyrgyz State Technical University, Kyrgyzstan, 720044, Bishkek, 66 Aitmatov Ave., e-mail: aigiuzel.bakalova@kstu.kg

ABSTRACT

The article is devoted to the consideration of the key factor in the creation and successful functioning of the digital economy ecosystem in the Kyrgyz Republic - Digital transformation in the education system. The key areas of work on the digitalization of education in the Kyrgyz Republic have been identified. The article considers a comprehensive assessment of the level of university digitalization according to the methodology of the national ranking of universities of the Kyrgyz Republic. The mechanism for calculating rating indicators is described. The methodology for calculating the level of digitalization of the university is described, indicators are given.

CCS CONCEPTS

• **Applied computing**; • **Education**; • **Computer-assisted instruction**; • **CCS CONCEPTS**; • **Information system**; • **Information retrieval**; • **Retrieval models and ranking**; • **Learning to rank**;

KEYWORDS

internet, digital literacy, digital transformation of education, digital skills index, University 4.0

ACM Reference Format:
Koshoeva Bibigul Beishenbekovna, Chynybaev Mirlan Koichubekovich, and Bakalova Aigiuzel Taalaibekovna. 2023. Determination of the level of university digitalization by the method of the higher education institutional ranking of the Kyrgyz Republic. In *International Conference on Computer Systems and Technologies 2023 (CompSysTech '23), June 16, 17, 2023, Ruse, Bulgaria.* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3606305.3606313

1 INTRODUCTION

In the context of the development of the modern economy, where information and management technologies play a significant role in ensuring the competitiveness of the company, it is important not to miss the opportunity and take timely measures for the digital transformation of the organization's activities. Higher educational institutions of Kyrgyzstan operate in highly competitive conditions. New technological companies are entering the educational services market, providing the opportunity for comfortable learning based on Internet platforms; the number of private educational institutions that occupy a significant market share is growing. At the same time, potential customers of universities and consumers of educational services are making new demands on approaches and methods of teaching. One of the key criteria when choosing a university is the availability of a modern material and technical base, the use of advanced IT solutions in the educational process, the activity of the university in the Internet space, the possibility of remote interaction with teachers using modern communication technologies [1].

2 DIGITAL TRANSFORMATION IN THE EDUCATION SYSTEM IN KYRGYZSTAN

Today Kyrgyzstan is a dynamically growing innovation ecosystem that is integrated with the global world and attracts technology, investment and qualified personnel. Advanced digital technologies, such as artificial intelligence, big data and cloud computing technologies, have begun to be actively used in Kyrgyzstan. Digitalization of Kyrgyzstan sets the task for the education system not only to digitalize public services in this area, but also to introduce new methods and approaches into the educational process [1].

The model for the development of hybrid learning in the post–pandemic period is the creation of a modern digital environment at all levels of education in the Kyrgyz Republic for effective management of the education system and ensuring transparency of educational processes.

The education system and universities of the Kyrgyz Republic have adapted to work in conditions of "COVID" restrictions [9]:

- The system of online admissions to educational institutions has been introduced,
- The digital infrastructure of universities has been modernized to the best of its capabilities, taking into account online and blended learning,
- Internet service providers present special tariff packages for students and teachers of educational institutions,

CompSysTech '23, June 16, 17, 2023, Ruse, Bulgaria

ACM ISBN 979-8-4007-0047-7/23/06.
https://doi.org/10.1145/3606305.3606313

- Digital educational content is being developed in universities, etc.

Based on the results of surveys of experts and stakeholders of the Kyrgyz Republic, key areas of work on further digitalization of education have been identified:

1) Digital infrastructure of educational institutions,
2) Improving the digital competence of school teachers/teachers and technical specialists providing technical support,
3) High-quality training of IT specialists,
4) Development of scientific research in the field of information technology and training of scientific and pedagogical personnel,
5) Topics for national projects on digitalization of education.

Also, an expert group of the Ministry of Education and Science of the Kyrgyz Republic, the Kyrgyz Academy of Education and the Media Support Center with the financial support of the Soros-Kyrgyzstan Foundation has developed a methodological guide for the introduction of digital education into the educational system of the Kyrgyz Republic [4]. The methodological guide includes sections devoted to the analysis of existing educational standards in the Kyrgyz Republic at all levels of the education system and recommendations for the introduction of media, information and digital literacy competencies into new educational standards in the Kyrgyz Republic. The guide is recommended for use when revising the content of school and university education standards in order to transform to digital education.

There are digital skills training of different versions of Education 1.0, 2.0, 3.0, 4.0 [11].

Digital Skills training version 1.0 means an approach based on the dictate of the teacher/lecturer. Here the model looks like this: listen to the teacher; answer questions, read study materials; perform tasks on the computer. This is a standard behavioral type of education, when all students study according to a single standard, regardless of their level of knowledge and interests.

Digital Skills Training version 2.0 means a collaborative approach. Here the model looks like this: listen to the teacher; ask questions, read educational and additional materials; work on complex tasks in small groups. This is a constructivist type of education, when all students study according to a single standard, but depending on their level of knowledge and interests, the program varies due to elective courses, independent work with teachers and work on their own projects.

Digital Skills Training version 3.0 means a mixed approach. Here, the model looks like this: listen to online lectures by a teacher; ask questions and solve problem-oriented studies at the Independent Work of a Student and a Teacher; work on real-oriented tasks using blogs, podcasts and related technologies of participation (interaction). This is a mixed type of education (blended learning), when the educational standard dictates only the mandatory part of the curriculum, and students, depending on their level of knowledge and interests, choose their own learning trajectory.

Digital skills training version 4.0 means an online-based approach. Here the model looks like this: online lectures of a teacher and video materials of specialists on the Internet; online work in teams on platforms; work on their own projects using blogs, podcasts and related technologies of student participation (interaction). This is an online type of education, when there is no single educational standard and one university, and students, depending on their level of knowledge and interests, choose their own learning trajectory from any educational service provider. The type of diploma or graduation document depends on the completeness of the workload and the emphasis is on the certification of professional skills. To date, digital skills training version 4.0 is being actively introduced in Kyrgyzstan.

Thus, Kyrgyzstan is currently undergoing a phased digital transformation in education. Determining the level of this transformation of universities, the authors propose their own methodology, which is reflected in the model of the institutional rating of universities in Kyrgyzstan [2].

3 METHODOLOGY OF THE NATIONAL INSTITUTIONAL RATING OF UNIVERSITIES OF THE KYRGYZ REPUBLIC

The program for the development of education in the Kyrgyz Republic for 2021-2040, approved by the Government of the Kyrgyz Republic No. 200 dated 05/04/2021, provides for the creation of a National model of university rankings as a launching pad for preparing universities to participate in international rankings.

The rating of universities is an integral assessment of their activities based on established criteria with the presentation of ranking results. The rating of universities is designed to provide the most complete information to potential applicants, students, parents, professional communities and employers about the potential of universities.

The rating at the national level is an auxiliary tool for determining the effectiveness of the university's activities, its readiness to ensure state order, competition in the international educational space according to various criteria and indicators.

Our research team conducted a study of university rankings, key indicators and evaluation criteria [5–9]. Based on this analysis, a "Methodology for determining the national ranking of Kyrgyz universities" was developed [6], which includes 4 criteria and a certain number of indicators:

- criterion "Conditions for obtaining a quality education" – 27 indicators;
- criterion "The level of demand for graduates by employers" – 4 indicators;
- criterion "Level of research activity" – 17 indicators;
- criterion "University brand" – 4 indicators.

The rating will be compiled according to different criteria and indicators. Since the system will be web-oriented, data collection and their authenticity can be carried out in a short time. At the moment, there are no analogues of this system in the Kyrgyz Republic.

The main objects of rating research are universities of the Kyrgyz Republic by levels (BA, MA, PhD), and the subject is quantitative and qualitative indicators on key parameters of indicators and rating criteria [1].

The rating is calculated according to a 100-point system according to the methodology for determining the national rating of universities in Kyrgyzstan [2]. At the same time, 40 points are

Table 1: Criterion "Conditions for obtaining a quality education"

Groups	Number of indicators	Number of points
Educational programs	6	9,5
Teaching level	5	6,5
International integration	8	9
The level of digitalization of the university	4	7
Demand among applicants	2	4
Quality of graduate training	2	4
Total for this group	27	40

given for the conditions for obtaining a quality education, 20 points – for the level of demand for graduates by employers, 30 points – for the level of research activity and 10 points - for the brand of the university. At the same time, if, according to any of the indicators, the university gains the maximum value among others, then it is assigned the highest score equal to 1. The rest of the universities are awarded points as a percentage.

Example:

In criterion 1 "CONDITIONS FOR OBTAINING A QUALITY EDUCATION" of the "TEACHING LEVEL" group of subgroup 1.7, the number of *Ri* – full-time teaching staff per 100 students (hereinafter, the share values related to teaching staff are given to the full rate) is calculated by the following formula:

$$R_i = \frac{R_t}{R_{st\_sum}} * 100 \ stud, \tag{1}$$

where *Rt* is the number of full–time teaching staff,
Rst_sum – the total number of students. The weight for this indicator is *h=1.5* [6].

Let's consider the structure of the criterion "CONDITIONS FOR OBTAINING A QUALITY EDUCATION" in Table 1:

4 DETERMINING THE LEVEL OF DIGITALIZATION OF THE UNIVERSITY

The assessment of the level of digitalization of the university can be made by analyzing various aspects of its activities [12]. The following are several factors that can be used to assess the level of digitalization of the university:

1. The use of digital technologies in the educational process. This may include online courses, the use of digital learning materials and software.
2. Availability of digital resources: electronic libraries, databases, online platforms for knowledge exchange and other digital resources.
3. Application of digital technologies in research. This may include the use of software for data analysis, the use of online resources for scientific publications, etc.
4. The use of digital technologies in administrative activities: e-mail, electronic forms and other tools.
5. Availability of special centers and laboratories for digital technologies and their use in the educational process.
6. Staff qualification: the skills of university staff to use digital technologies in their work.
7. Innovativeness: how innovative is the university in the application of digital technologies and how does it relate to new technologies and developments.

Taking into account the above, we offer the following indicators for calculating the level of digitalization of the university:

Indicator 1.20. The index of students' digital skills [10] is calculated for students from the questionnaire according to the formula

$$Ri = indicator/100 * 2,5 \tag{2}$$

The coefficient of this indicator $k = 2,5$.

Indicator 1.21. The amount of expenses for access to international Electronic Databases, libraries and analytical systems (for the past year, per 1 student) is calculated by the formula

$$R_i = \frac{R_{data}}{R_{st\_sum}} \tag{3}$$

where *Rdata* is the total amount of expenses of the university for Electronic Databases, thousand soms, *Rst_sum* is the total number of students.

The coefficient of this indicator $k = 1,2$.

Indicator 1.22. Availability of electronic services of the university *Ri = Rservis*, where *Rservis* – number of electronic services.

The coefficient of this indicator $k = 2$.

Indicator 1.23. The availability of the University 's electronic library is calculated by the formula

$$R_i = \frac{Rbook}{R_{st\_sum}}, \tag{4}$$

where *Rbook* – the number of electronic bibliographic data in the library.

The coefficient of this indicator $k = 1,3$.

Let's take a closer look at the calculation using examples:

Indicator 1.20. Index of students' digital skills [10]. It is determined from a questionnaire for students consisting of 15 questions of the following groups that shown in Table 2:

Index H = h1*0,4 + h2*0,4 + h3*0,2

Suppose we got a digital skills index *H = 48,6.*

Then Ri = 48,6/100*2,5 = 1,21

Indicator 1.21. The amount of expenses for access to international electronic databases, libraries and analytical systems

For example: There are 12,000 students in KSTU, *V* = 25 000 сом

Calculation: *Ri = 25000/12000 = 2,08* (look on Figure 1)

Indicator 1.22. Availability of electronic services of the university

Table 2: Questionnaire groups

Questionnaire groups	Points	Index
1. Possession of digital skills	0,4	h1
2. Usage of digital services	0,4	h2
3. Knowledge of the basics of information security and programming	0,2	h3
Total	1	

	Evaluation criteria and points		Ri			KSTU				KRSU				KSUCTA			
			KSTU	KRSU	KSUCTA			Rp	Ro			Rp	Ro			Rp	Ro
	Group: The level of digitalization of the university																
1.20	Student Digital Skills Index (determined from a questionnaire for students)	2,5	48	59	40			0,81	2,03			1,00	2,50			0,68	1,69
1.21	The amount of expenses for access to international electronic databases, libraries and analytical systems (for the last year, per 1 student), thousand SOMs	1,2	2,08	3,5	3,38	25000	12000	0,60	0,71	35000	10000	1,00	1,20	27000	8000	0,96	1,16
	Availability of infrastructure:																
1.22	Availability of electronic services of the university (internal document management, issuance of certificates, administration of students)	2	7	10	12			0,58	1,17			0,83	1,67			1,00	2,00
1.23	Availability of the University's electronic library	1,3	4,17	7	5	50000	12000	0,60	0,77	70000	10000	1,00	1,30	40000	8000	0,71	0,93
	Total	**7**							**4,69**				**6,67**				**5,78**

Figure 1: Calculation of digitalization of the university level on the example of 3 universities

According to the formula $Ri = Rservis$, where $Rservis$ – number of electronic services. If the university uses 10 electronic services, i.e. $Ri = 10$.

Indicator 1.23. Availability of the University's electronic library

For example, there are 12,000 students in KSTU, the number of books is 50,000

Calculation:

$$R_i = \frac{50000}{12000} = 4,6$$

Further, after all universities fill in the data, the calculation is made for each university separately and a ranked list is displayed according to the level of digitalization of the university as shown on Figure 1.

5 CONCLUSION

In the developed methodology of the national ranking of universities of the Kyrgyz Republic, there is a group "The level of digitalization of the university" with 4 indicators that can be used to determine the rating of universities by the level of digitalization of the university 4.0.

The proposed method is universal. According to this methodology, a system has been designed and a web-oriented information system has been developed, with the help of which it is possible to continue conducting research on the level of digitalization of universities in the Kyrgyz Republic [3, 13].

The research will allow for Kyrgyzstan:

- to measure the level of development of student's digital skills of universities in the Kyrgyz Republic,
- collect data for annual analysis on digital skills,
- collect data on the amount of expenses for access international electronic databases, libraries and analytical systems,
- collect data on the availability of universities infrastructure.

REFERENCES

[1] Chynybaev, M.K., Digital transformation of education on the example of KSTU/ M.K. Chynybaev, B.B. Koshoeva, A.M. Arzybayev, A.T. Bakalova // Izvestiya KSTU named after I. Razzakov. – 2019. – №4 (52). – p. 88-95.

[2] Koshoeva, B.B., Methodology for determining the national ranking of universities in Kyrgyzstan/ B.B. Koshoeva, B.T. Torobekov // Certificate of state registration of the copyright object No. 3916 dated 08.07.2020

[3] Koshoeva B.B., Designing business processes of the institutional rating system of higher education of the Kyrgyz Republic/ M.K. Chynybaev, B.B. Koshoeva, A.R. Abdyldaeva, A.T. Bakalova // High-performance computing systems and technologies. – 2022. – T. 6, №1. – p. 180-185.

[4] Methodological guidelines for the introduction of digital education in the educational system of the Kyrgyz Republic. Bishkek, 2020.

[5] Gladkikh, Ya.N., Analysis of university rankings as a basis for determining the target indicators for the development of innovation activity of the University of PSNIU / Gladkikh Ya.N., Gladkikh Yu.N. //Alley of Science. –2018. – №10 (26). – p.181-189.

[6] Losh E. The War on Learning: Gaining Ground in the Digital University. Cambridge, MA: MIT Press, 2014. 302 p. DOI: 10.7551/mitpress/9861.001.0001

[7] Altbach Ph., Reisberg L., Rumbley L. Trends in global higher education: Tracking an academic revolution. Rotterdam, Netherlands: Sense, 2010. URL:

[8] https://www.cep.edu.rs/public/Altbach,_Reisberg,_Rumbley_Tracking_an_Academic_Revolution,_UNESCO_2009.pdf (date of access: 15.10.2020)

[9] Wood J. and Carpenter J. (Education for Change): Development of a national model of education quality and design of its monitoring system. Under the general leadership of A. Parsi, Y. Narolskaya, UNICEF Representative Office in Uzbekistan, 2014.

[10] https://www.unicef.org/uzbekistan/media/3656/file/QEF_Conceptual_Framework_rus.pdf

[11] Source: "Digital Kyrgyzstan: The Current State and the Way forward», http://ict.gov.kg/

[12] Chynybaev, M.K. Methodology for determining the index of digital skills of the population of the Kyrgyz Republic / M.K. Chynybaev, B.B. Koshoeva // Certificate of state registration of the copyright object No. 4079 dated 12/14/2020

[13] Pecypc: www.ecdll